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THE

NEW ENGLAND

Journal of Dentistry.

VOL. II. MARCH, 1883. No. 3.

ORIGINAL COMMUNICATIONS.

ON SOME SCIENTIFIC PROBLEMS OF DENTAL SURGERY.

BY C. S. TOMES, M. R. C. S., AND L. D. S., ENG., F. R. S., ETC.

Read at the Annual General Meeting of the British Dental Association, at Liverpool, August 25, 1882.

It is a reproach of long standing that the method and practice of medicine are unscientific, and that they are merely empirical, whilst the practitioners of medicine in the early days of the separation between medicine proper and surgery in their turn looked down upon the surgeons as even less scientific than themselves. It was not long before the surgeons made such strides in their art that they could claim full equality with the physician, as rendering useful service to their patients; but, more particularly where handicraft forms an important element in treatment, there long lingered a tendency to draw a distinction between the so-called "practical" and the "scientific" man, to the detriment of the latter. Other and far abler pens than mine have demonstrated the fallacy which underlies such distinctions by pointing out that "scientific" knowledge differs from any other knowledge in no respect but in that a rigorous accuracy of fact is demanded, and vague beliefs incapable of proofs are rejected; so that to say a word against science in our practice is simply to plead the advantages of ignorance.

The immense triumphs which have been achieved by modern surgery, triumphs which are being added to every day, are the outcome of the pursuit of more rigorously scientific methods, and if we in our specialty of dental surgery would advance likewise, we can only hope to do so by following a similar course. So much I have said by way of prelude, in order to remove any impression that might exist that "scientific problems" lead to no practical result. And I am sorry to say that a review of recent dental literature brings sadly into prominence the lack of true scientific spirit amongst our workers; it is voluminous enough, it is positive enough, but the voluminousness and the positiveness alike are the outcome of insufficient observation, insufficient experiment, and insufficient exactitude of thought. Take for example the discussion as to those physical qualities of gold which we term cohesiveness and non-cohesiveness, or take the much discussed questions arising out of amalgams and their defects; and of all that has been written there is not one hundredth part which is worth reading, or which can possibly carry conviction to any one's mind. It is always, "I am sure," "I have all my life known," or something to that effect, and very rarely an experiment, or statistics, or anything convincing. And when we have statistics or experiments, they are too often such as to demonstrate by internal evidence that little reliance can be placed upon them. In this depressing state of things it has seemed worth while, although having little in the way of research to communicate, to formulate exactly what we want and need to know about some of the conditions we are most often called upon to treat, namely about alveolar abscess and its causes.

Surgeons, and physicians too, are at the present time largely engaged in investigating what is termed the germ theory of disease, and this has, as you all know, a most practical bearing upon treatment. That aspect of the question which mainly concerns us may be broadly put thus; whether certain morbid conditions can and do arise within the body itself, or whether they are imported from without, in the form of germs or what not. It would be entirely out of place to here attempt to give any outline of the basis upon which antiseptic surgery rests, but it may be well to remind my hearers of some few of those experiments and observations which bear most directly upon the problem before us.

It is thoroughly well established that organic fluids or tissues, though eminently susceptible of decomposition, do not undergo putrefactive decomposition without the help of organisms, bacteria and micrococci,

which grow in them, and act apparently as ferments. If these are excluded, as they are from an aseptic flask, or are killed by boiling, as is the case of tinned meat and vegetables, no putrefaction takes place. According to Dr. Ogston, micrococci do not produce putrefaction, and flourish best when removed from the air; on the other hand, bacteria cause stinking putrefactions.

Portions of tissues cut from animals just killed and passed, with full antiseptic precautions, into an aseptic flask may be kept fresh for an unlimited time; and this leads to the inference that the germs of micrococci and bacteria do not circulate in healthy blood, and do not exist in healthy organs. But introduce a trace of dust into the flask, and the whole contents at once putrefy, whilst the putrid fluid is found to swarm with organisms. So also the discharges from a wound kept aseptic do not putrefy, and the patients do not get pyemia or septicæmia, except through the failure of the antiseptic precautions. Another most instructive experiment is being every day performed on a large scale. In the south of Europe the castration of male animals is effected by an operation termed "bistournage;" roughly speaking, this consists of twisting the testis upon the spermatic cord, so that without any exposure to external influences at all it is killed, and instead of putrefying, it withers away. This portion of tissue, killed by the severance of its vessels, is analogous to the pulp of a tooth which has been killed by a blow, to which I shall revert. But Professor Chaveau has carried this experiment farther; he has introduced bacteria into the veins of animals upon whom bistournage was about to be performed, with the result of bringing about the decomposition of the killed testis, which then became the cause of profuse suppuration; so that the proof is in this case exceedingly complete that a portion of tissue may be devitalized without decomposing and without setting up inflammation around it to any material extent so long as it is not exposed to external influences; but once introduce septic organisms into it, even by way of the circulation, and this happy result is no longer attainable.

One might multiply examples of this fact to any extent, but I will merely remind you that surgeons, in subcutaneous operations, have for years availed themselves of the immunity from subsequent ill-results afforded by the avoidance of any exposure to outside contamination. In septicæmia, micrococci may generally be detected in the blood, as they also may in several morbid conditions which do not concern us now.

It sometime ago occurred to me that we had, in the numerous cases of abscess which come before us, the opportunity of studying to considerable advantage the share which organisms take in these productions, but I have not since been able to make my observations sufficiently numerous to draw any general principles from them. So far as I know there is no literature on the subject of the connection of organisms with dental abscess, with the exception of allusions to alveolar abscess in a report by Dr. Ogston (British Medical Journal, March, 1881). He found micrococci and bacteria in the pus from alveolar abscesses; and generally speaking, he found organisms in the pus of all acute abscesses which he examined, but did not find them in that of "cold" abscesses. We are not told in his paper of what nature the alveolar abscesses examined were, whether acute or chronic. Amongst the many important results in Dr. Ogston's report, which will repay the most careful study, is this: that injection into animals of pus which contained no micrococci produced no result, but that of pus containing micrococci, or of micrococci artificially cultivated, always produced abscess, though if thoroughly carbolized it did not do so.

The pulp chamber of a tooth is a cavity which, prior to the occurrence of caries, is absolutely isolated from external influences, and has but one channel into it, namely, its apical foramen; even after the occurrence of caries it can be tolerably easily and completely closed. And hence it is a particularly favorable place for investigations of this nature, and, it might be hoped, would lead to results of wide application.

It has been shown by Messrs. A. Underwood and Milles that bacteria are to be found within the substance of carious dentine, and this fact remains established, whatever view may ultimately be adopted as to the extent of their influence upon the morbid process. The observation that bacteria are not to be found within healthy dentine, which, therefore, even in the absence of enamel, constitutes an efficient barrier, and that they are to be found in carious dentine, is one that has an important bearing upon the present inquiry.

For our present purpose we may consider alveolar abscess as occurring under three sets of conditions: 1. Where the pulp of a tooth has been somewhat nearly approached by caries, a filling has been inserted, and, after the lapse of an uncertain time, the tooth pulp is found to be dead and decomposed. 2. Where the pulp has been killed by a blow, with no breach in the hard tissues of the tooth.

3. Where after removal of the debris of the pulp, and filling or dressing of the roots, abscess recurs after the lapse of considerable time, and without failure of the filling.

I have placed first death of the pulp as a sequence to caries and filling of the tooth, because the problem there involved is a simple one, and also because I have more positive evidence to offer upon this set of conditions than upon the others.

I have purposely excluded all observations upon cases in which an alveolar abscess had already broken, because in these there was a communication with the exterior of the gum, through which the germs might have entered. Of cases in which I was able to open up the pulp chamber, prior to the occurrence of abscess, I have only met with six since my attention has been directed to the subject, and in every one of these six I found the offensive fluid debris to contain bacteria and micrococci. But it is not always easy to be certain whether micrococci are or are not present, as there is always a great deal of granular matter which renders their discrimination less certain than that of the rod-shaped forms. As I have before mentioned, it is not difficult to account for their presence, seeing that carious dentine affords a home for them, and that there may have even been a minute actual exposure of the pulp. But it is a question of great interest, and of practical importance, too, to discover, if possible, what share the organisms have had in provoking the inflammation of the pulp which has preceded its death, and in the subsequent changes in the way of its decomposition.

In the admirably clear lecture of Professor Burdon Sanderson on Inflammation (reported in the British Medical Journal for April, 1882), it is related as proven that in the cornea, its epithelium being damaged, an inflammation springs up which is due to the entrance of germs and their multiplication in its substance, and it is worth noting that in these exceptional cases in which the early extraction of the tooth has, for some reason or other, been resorted to, and we get the opportunity of examining the pulp prior to its entire death, we always find that the point of inflammation and disintegration corresponds to the point of complete or approximate exposure, and that a stinking decomposition has been set up at this point, while the rest of the pulp is alive, and, as far as we can see, healthy, beyond this zone of inflammation. So far it looks as though something getting in had done it, as though microzymes had entered, and the inflammation were comparable to that in a cornea of which the surface has been

damaged; actual observations on the presence of bacteria at this stage are, however, wanting, and they are much needed. I have only a single observation to record, in which I found the bacteria abundant.

On the other hand, as Professor Burdon Sanderson well insists, the view that all inflammations are due to organisms is quite untenable, and inflammation may spring up at once in a part which has been subject to damage, without the possibility of the entrance of germs; so that we are by no means driven to the absolute conclusion that the bacteria which I found were the causes of the inflammation. But these inflammations which are the result of physiological "damage" to a part, elsewhere come to a kindly ending. In his own words, "an uncomplicated inflammation is neither reproductive nor infective, neither benign nor malignant; if it has any tendency, it is to leave off as soon as the occasion for it passes." Therefore the tooth pulp, supposing that it really has inflamed before its death, should not on that account give rise to products capable of poisoning the parts about the apical foramen.

At page 293, he says: "I endeavored to show, on the ground of experiment, that the only inflammations to which minute organisms stand in relation are those which, from their proved dependence on previously existing inflammation, may be properly termed secondary or infective; and consequently that the organisms in question were not so much mischief-makers as mischief-spreaders. That is to say, although an inflammation may come into existence without their aid, their presence communicates to it, after it has come into existence, the power of reproducing itself in previously healthy tissues, whether by extension or dissemination. These facts he sums up: "1. That the exudation of a normal inflammation is not infective. 2. That no organisms endowed with inflammation-producing functions exist in the atmosphere or in ordinary aqueous liquids with which our bodies come in contact. 3. That whenever an inflammation becomes infective, it owes that property to chemical change in the exudative liquid, of which the presence of microzymes is a necessary condition." Now if we attempt to apply these canons to dental diseases, we are at once struck with the fact that the contents of the pulp chamber of a tooth are in a sense virulently infective, for the escape of the smallest quantity from the apical foramen sets up a most violent inflammation and abscess, which, however, only very rarely spreads further (though in one of my cases in which the patient was long in seeking relief there was almost erysipelatous inflammation of the face attended

with considerable fever), but there is, so far, no difficulty in understanding how the tooth pulp may have complied with the conditions laid down by Professor Sanderson, as to a prior inflammation, the exudation of which, with the presence of organisms, has become infective. But it is a matter of some moment to us to discover, if possible, whether we have most often to deal with an inflammation caused by the invasion of the pulp by microzymes, or set up by irritation, for in the one case the profuse and persevering use of antiseptics is indicated, in the other sedative applications, and this point can only be elucidated by very numerous and very careful observations.

Passing now to our second group, we have by accident most instructive experiments brought under our notice not rarely, when the pulps of front teeth which have been severely struck die, although the hard tissues of the tooth are quite intact. Here we have a portion of tissue dead, which has in no way been exposed to external agencies. No germs can have entered it from without, and it is in this respect in the same position as the testis killed by "bistournage," or as a portion of tissue cut out and introduced into a flask with antiseptic precautions. It therefore might fairly be expected to remain mummified without undergoing any putrefactive decomposition; and this does sometimes happen, a case of this kind having come under my own notice, since my attention has been specially directed to the subject.* But much more frequently, after an interval of exceedingly variable length, violent alveolar abscess ensues, and on opening up the tooth by drilling into it we find the contents of the pulp cavity stinking, whilst the violence of the alveolar abscess betokens the virulence with which the tissues adjacent to the apical foramen have been infected.

It becomes a matter of the greatest interest to discover whether organisms do or do not play a part in this sequence of events, and the solution of this problem has a bearing on questions far wider than the field of dental surgery. And the importance of the experiment is almost equally great, whether it turns out that bacteria or micrococci are there, or not. For if there, they must have got there by way of the circulation in a healthy individual, and must have been (1) present in the tooth pulp prior to the accident, or (2) have entered it during the brief period of inflammation which we know clinically to sometimes intervene between the injury and the death of the pulp, or

* And since the reading of this paper I have met with two central incisors, the pulps of which had been killed four years previously; there was tenderness and slight fullness over the apices of the roots, and the pulps themselves were coherent, white and sodden, but without any offensive smell. No bacteria were found.

else, if the death of the pulp has been instantaneous (3) have crept in by the apical foramen subsequently—a hypothesis which does not commend itself as probable.

On the other hand, if, after extended and numerous observations, no organisms prove to be there, we shall have proof of a putrefactive decomposition with stinking and poisonous products taking place without the intervention of bacteria or micrococci; in other words, that which, according to the doctrines of modern surgery, ought to be in the condition of an aseptic slough, becoming septic.

One does not meet with these cases very frequently, and it would require a large number of observations to prove a negative, yet so far I have not succeeded in quite satisfying myself of the presence of either micrococci or bacteria in any case which I have examined; in one case I found a few bacteria, but they were so few, and so unequally distributed over the slide that I suspected their not having been derived from the fluid from the pulp chamber. The question, then, for the present remains open, but I would point out that the occurrence of alveolar abscess after the death of a pulp killed by a blow is very often a slow process, extending over months or years, or never happening at all, whilst an abscess usually follows very speedily on the heels of the death of a pulp which has been nearly or quite exposed.

And whilst it is comparatively easy to find bacteria, or be satisfied of their absence, it is very different with the round micrococci, for the debris of these pulps is almost made up of granular material.

The third group of cases are those which are most troublesome in our daily practice, those cases, namely, in which alveolar abscess recurs after we have done what we can in the way of treatment. It is, of course, a familiar fact that if we can pump creasote through the apical foramen and out through a fistulous opening on the gum, that alveolar abscess may be readily and speedily cured in almost every case, and this would seem to point to its being kept up by organisms. As a matter of fact, I have frequently found them present in the pus, and again sometimes I have failed to find them; but I attach little importance to this, inasmuch as I have found them abundantly one day, and on the next, the abscess having meantime greatly subsided, have found very few.

The cases, however, which are most important, and most troublesome, are those in which the roots have been thoroughly treated with antiseptics, and filled, say with cotton wool, saturated with creasote. The tooth has remained quiet for a considerable time, and

then becomes tender and an abscess threatens. On removing the filling the wool from some one of the roots is found discolored and offensive. It is hardly to be supposed that organisms have got in subsequently to the filling by way of the tooth, so here again we are in face of alternatives; either we have that which is generally believed never to occur, a putrefactive decomposition without the intervention of organisms, or the germs have escaped the creasote, lain latent for a time, and then developed.

It is a familiar observation that cold will provoke an inflammation about a heretofore quiescent dead tooth; this would be intelligible enough as an instance of a "damage" to a part already perhaps below its standard of health, but whence come the stinking products which leak into the roots of the tooth if there are no microzymes?

And these products we know to be infective, for if in our manipulation we pump anything, no matter how little, through the apical foramen, we set up an acute abscess. Of these cases I have not had an opportunity of examining a sufficient number to draw any conclusions, but I may remark that the late Dr. Dean, in a paper on alveolar abscess, read before the International Medical Congress, laid much stress upon the application of the rubber dam to a tooth in which an alveolar abscess had been cured prior to the removal of the dressing; and he was advocating these "antiseptic precautions," although speaking purely from the clinical point of view. I myself asked him the question, prior to the reading of the paper, whether he advocated this precaution for a theoretical reason, or as a result of practical experience, and he told me purely on account of the latter. He saw, then, from his clinical experience, the necessity of excluding something; of its nature he was uncertain.

On the other hand, if we are contending with living organisms, it is strange that we cannot secure more uniform success, for we are able to bring into play antiseptics with a directness and in a strength impossible elsewhere in the body.

To recapitulate briefly, it is believed that:

1. Putrefaction with the development of stinking products depends upon the presence of organisms.

2. Inflammation may be directly caused by organisms, or it may arise independently of them.

3. Infective inflammations are associated with the presence of organisms.

And we find that:

1. Tooth pulps nearly exposed by caries inflame, die, putrefy, and infect the parts around the apex of the root, and that organisms are found in the debris of the pulp and in the pus of the subsequent abscess.

On the other hand that:

2. Tooth pulps never exposed to external contamination die, putrefy, and infect the parts outside them; and that organisms have not, so far, been satisfactorily demonstrated in them.

And again:

3. The dressings in the roots of dead teeth, under circumstances which would render the multiplication of organisms unlikely, do become saturated with offensive fluid.

But against this last we may set the fact that success in the treatment of alveolar abscess seems to be about proportionate to the completeness with which antiseptics can be brought into contact with all the surfaces concerned.

I feel that I owe this meeting an apology for bringing before them so imperfect an investigation; but there is one excuse for my doing so, and that is, that it is an investigation which to be at all fruitful of results must be carried out by many observers, and, so far as I know, attention has not been very definitely directed towards it. I hope, for my own part, when my observations have become sufficiently numerous, to publish them in detail, and that, by that time, there will be many others to confirm or disprove them. It may well be that the pursuit of this line of investigation will lead to most practical results in dental surgery, for if it be the case that rigid antiseptic precautions are our only road to success, we have excellent means of applying them by the use of the rubber dam. I may mention that I have lately always, when practicable, removed devitalized pulps under a pool of eucalyptus oil, so that this may run in as the pulp is removed, and no septic contamination take place during this part of the operation; but as good results are ordinarily attainable without this precaution, it is too soon to speak of its value.

On the other hand, failing a practical result for dental surgery, the investigations cannot fail to be of value in throwing light upon a great question of pathology, for the isolation of the pulp chamber of a tooth eliminates a great many of the sources of error and uncertainty which beset similar research upon other organs of the body.—*Journal of the British Dental Association.*

"WRITE THE VISION AND MAKE IT PLAIN."

BY C. T. STOCKWELL, SPRINGFIELD, MASS.

In the January number of the Ohio State Journal, Dr. Watt, its editor, makes the "greatest effort of his life" in an attempt to demolish the germ theory of dental caries, and defend the chemical. In this article I have not the slightest wish or purpose to reply to his lengthy and amusing allusions to my paper, published in the November number of the New England Journal. If he—Dr. Watt—his listeners, or his readers enjoyed, in the least, his sallies of wit, etc., they are all most heartily welcome. Witticisms do not annihilate facts or befog the thinking mind.

We have to thank Dr. Watt, however, for giving us so clear a statement of the *process* of chemical action. It is so good that we must quote it here.

"As ammonia is composed of nitrogen and hydrogen, its oxidation results in nitric acid and water. . . . Remember, too, that ammonia always results from the putrefaction of nitrogenous organic compounds. Suppose an atom of nitric acid has got through the enamel—not through the hole that Mayr's bug goes in at—but through a defective spot. It acts on the dentine—faster on the lime than on the gelatin." (Gelatine?) "A thin layer of the lime-salts is dissolved, and of course, a thin layer of organic matter is left. By putrefaction it gives ammonia, to be oxidized into nitric acid, to dissolve more lime, and expose more organic matter, to putrefy and give more ammonia, to be oxidized into more nitric acid, to dissolve more lime-salts,—and thus, on and on, till the pulp cavity is reached."

We said we have to thank Dr. Watt for so clear a statement. It occurs to us, however, that it is possible to "write the vision and make it *plain*"–*er*. Let us see. We will suppose that a particle of meat, say one-half grain, is lodged between the teeth. Now we will grant that the result of the putrefaction of this one-half grain of meat *may* be, first, ammonia; that the ammonia *may* combine with oxygen (ozone) and form nitric acid; that this nitric acid *may* attack the lime-salts of the teeth, and as a result of this attack upon the lime-salts, by this nitric acid, a portion of the organic matter *may* become unclothed, "as it were," which *may* die, when we shall have some more "*meat*" to putrefy and produce some more ammonia, which *may* combine with more oxygen and give us more nitric acid, which *may* attack other granules of lime and uncover some more *organic* matter to die, to putrefy, to form more ammonia, to be oxidized, to result in more nitric acid, etc., "and thus, on and on, till the pulp

cavity is reached." All of this *may* (??) be admitted to be *theoretically possible.*

Now let us apply a few figures to this beautiful *possible* theory and see, if we can, how small a hole Dr. Watt is driven into in order to explain the process of chemical action in dental caries. Perhaps we should say "white decay," much, by far, the larger proportion.

We will take our supposed one-half grain of meat—a liberal allowance—and lodge it between somebody's molars. We will grant that it will putrefy. But will it putrefy if *no organisms* are present? We will grant that the result of the putrefaction of this one-half grain of meat *may* be ammonia; but under the conditions found in the mouth it *may not*, too. Granting, however, that it does produce ammonia, it will require, at least, *two days* to bring this about; and then *how much* ammonia have we got, practically, from this one-half grain of meat? Well, to be liberal, we will say about $\frac{1}{300}$ of a grain. Now we have $\frac{1}{300}$ of a grain of ammonia between our supposed molars—but there is some saliva there too. But we will allow that all of this $\frac{1}{300}$ of a grain of ammonia *may* become oxidized,—practically a small fraction of it, say $\frac{1}{10}$ will possibly become oxidized,—and that we have some nitric acid in the "nascent state." But *how much?* To be liberal still we will say, about $\frac{1}{1000}$ of a grain. Now this $\frac{1}{1000}$ of a grain of nitric acid will have to be *lively* or it will become diluted with the water that is set free at the same time it is born from the ammonia—to say nothing of the saliva it finds itself in. However, Dr. Watt's nitric acid *is* a lively kind, so we will admit that this $\frac{1}{1000}$ of a grain of nitric acid *may* (*?*) get hold of some lime-salt in the unfortunate molars between which it finds itself. Again: *How much* lime will this $\frac{1}{1000}$ of a grain of nitric acid *dissolve*, even when it puts in in its best licks and starts when it is "a-borning," or in its "nascent state?" You must guess at the figures to apply here. We may admit the *possibility* that some infinitesimal amount *is* dissolved—about $\frac{1}{10000}$ of a grain of lime. Then what? Why! this $\frac{1}{1000}$ of a grain of nitric acid is neutralized, the affinity satisfied, and the acid is rendered harmless. But Dr. Watt says that there follows a disastrous sequel. "A thin layer of organic matter is left." Would to the Great Goodness that he had told us how "thin" this "layer" is that "is left." It must be *thinner* than "the hole that Mayr's bug goes in at" by several furlongs. Having granted so much already, we must still allow that some (?) organic matter is laid bare, and that we have some more "*meat*" to putrefy, to give more ammonia,

to oxidize, to give nitric acid, to again dissolve still more lime, etc. But he forgets to demonstrate just how this second dish of "*meat*" is slaughtered, and by what agents. Live tissue does not putrefy and give us ammonia to form nitric acid, to attack the next "layer" of undissolved lime, and so "on and on, till the pulp cavity is reached."

When we see that our one-half grain of meat gives only about $\frac{1}{4000}$ of a grain of nitric acid, we see the need of some beautiful microscopical figuring to get at the actual or even approximate amount of nitric acid that *may* (???) be generated from "the thin layer of organic matter that is left" as the result of the first attack. Estimate, if you can, the figures that will represent the weight of this "thin layer," and the amount of nitric acid that can by any possible means result from the *possible* death and putrefaction of the same. By the same basis of calculation—by no means fanciful—we have simply $\frac{1}{2000000}$ of a grain of nitric acid. Remember also that this is only the *second* term of the infinite series of the putrefactive process. As we proceed, we get an attenuation that ought to electrify the most ardent Homœopathic school of high dilutionists, for the *third* term would give us $\frac{1}{4000000000}$ of a grain of acid to dissolve (*how much?*) lime of the *next* "layer." Again: Estimate, if possible, the number of quintillion times that this process must be repeated before "the pulp cavity is reached" in an average adult's tooth, and the number of *illions* of years it will require to accomplish this result, even under the most favoring conditions. It 's the old story of Achilles and the snail. The snail ("the bugs") arrives at Troy in advance of Dr. Watt's Achilles (nitric acid).

If it requires at least two days to bring about even the *beginning* of ammonial elimination in our one-half grain of meat, and we allow that the hypothetical series may even be completed in the same time, we can *begin* to calculate—we can do no more than begin—the number of terms in the series that are *possible* in a year and the age of our Methuselah when the *contents* of "the pulp cavity" will begin to react upon Dr. Watt's rapidly on-going nitric acid. This may seem to be an attempt at ridicule, but it is not. It is simply an attempt to apply honest figures to a chemical proposition, and it is not the first time that a chemical proposition has gone down under the weight of its mathematical inaccuracy.

If such be the truth in regard to the chemical theory of dental caries, is it any wonder that no one but Dr. Watt dared to attempt an explanation of the *process*, or when asked just how acids performed

their accredited work, the reply was so positively nebulous? We are monstrously dazed at the audacity of a man who can put forth such a theory and still claim to be in a normal state of mind—if not of body. Such a mind must be in a "nascent state," as sure as the gods.

In connection with this hypothetical statement of the action of nitric acid in white decay, it may be well to offset the positive statement of a competent chemist that no acids or compound of acids and lime-salts are to be found on the field of battle, and that by the concurrent testimony of numerous microscopists, Bacterial organisms are found present in every case. Dr. Watt, himself, after beating the bush persistently and vigorously for forty years, only claims to have seen the "*tracks*" of his pet dragon. No game dangles at his belt after so long a chase in the wilderness. But he is sure that the beast is there, for his *supposed* tracks are all about. Is n't it just possible that the particular animal that the Dr. is looking for did not make the tracks and is not in that jungle at all? The germ theorists have not only the tracks, but they also exhibit the game, and can "write the vision and make it plain"–er to those who are not blinded by some pet theory that must be maintained in spite of revelations of facts that leave to them only the most vague hypothesis and misty sophistry.

SOME INTERESTING CORRESPONDENCE.

It was our fortune to be shown some interesting correspondence, between two well-known dentists, regarding the etiology of dental caries, and as it seemed to us too good to be thrown into the waste basket or, rather, too good to be kept as their own sole property, we have secured it for publication in order that the profession may have the benefit of the discussion. It was written simply as friendly letters are usually written between parties interested in a common subject, without the slightest idea that it would ever appear in print, and we give it without material change or modification, save making it anonymous. If our readers will follow it carefully, we think they will agree with us that some good points are made, and these letters are of more than private interest and value. We trust, also, that the series is not concluded. We only regret that we cannot give, as a preface to these letters, a report of the personal discussion of which they are the evident sequel. It may, however, be inferred from the character of the letters that follow.—ED.

DR. A.

Dear Sir: In our little talk last evening, I mentioned the *possible* agency of germs in caries, by absorbing pabulum from dentine; also, possibly, by appropriating oxygen or other elementary substance from tooth structure.

I might have maintained another *possible* modus operandi, viz., their influence in changing nerve function.

I need only to call your attention to the fact that nerve matter—or fibrillæ—seems the last to yield its activity in caries. In the softened dentine, where germs (Bacteria) are abundant, nerve matter is found in a very active condition.* We need only to remember the function of nerves in all physiological action to see the possibility that normal nutrition can be greatly impaired through the whole line of dentine by changes made by Bacteria upon their yet living terminal portions in the softened dentine. To understand just what these changes can be, we need more knowledge of vital processes in animal tissues, or, as Prof. Mayr says, "of the chemistry of albumen."

I make these suggestions for subject of thought. Pins set up for you to to knock down.

Yours truly, B.

DR. B.

Dear Sir: Your kind letter is duly received. You are right in regard to the fibrillæ being the last dental tissue to yield its activity in caries. The microscope shows that to be a fact. As to the agency of organisms in absorbing pabulum by appropriating oxygen, etc., from tooth substance, I cannot have any *positive* opinion either way. We may judge from the fact that caries is apt to progress in finely filled cavities where no "antiseptic" has been used, that many species of Bacteria do not depend upon the oxygen of the *air* for development. But in the *depths* of zone-like softened portions, where a small crown cavity has existed for years, and where, in this softened portion, deep into the crown, we find that which, according to Miller, is a Bacillus, we would, upon such a theory, expect proliferation of Bacilli and destruction of dentine. This is not so. Everything in the way of breaking down has ceased long since in *many* such cases. Your suggestions are, however, most tersely put, and they should have a careful consideration.

I have a different view of your position than I had previous to our

*The sensitiveness of carious dentine is probably due to to the presence in it of living fibrils which have escaped the action of organisms.—B.

interview Tuesday eve. I only wish it were so we could have them often, and I am glad to see that it is broader upon this subject than I had supposed.

If Bacteria, by their presence in the softened dentine, interfere with nutrition, which is no doubt true to a certain, though to what extent we don't know, but must find out if possible—the decay—after inception in *live* teeth, is to *my* mind due to *atony*—germs being the *cause*, if you please, but in no other sense.

I believe that you now understand my position. If I have any theory, it is the atonic, and that theory will apply to live teeth—and if we understand that a low circulation—nervous—in "devitalized" (*pulpless*) teeth is maintained through the pericementum, the theory will apply to them as well—though I feel very certain that in the latter condition—that of "dead teeth"—the product of fermentation and putrefaction causes a more rapid disintegration of the basis substance, so that we *never* find in pulpless teeth, that have after losing their pulps become carious, the fully formed basis substance in the cavity; but, on the contrary, a very soft, offensive amount of debris.

I have said all along that I have *no* theory. I have meant it, too; and it seems unfair to be judged as wrong in insisting, as I do, for *facts* first. What facts I have look more favorably to the theory of atony than to organisms. You perhaps say, "Well, but organisms cause the atony! What is the difference between us?" Just this: You say, "A man was injured by being run away with." No, he was injured by striking the ground—it of course being conceded that if the horse had not run he would not have been injured.

Still, we are far from the primary cause of decay. General atonic conditions cause the special conditions favorable to tooth caries. What causes the primary lesion? Let us be careful, studious and modest in our work, stating facts as they are developed.

Truly yours, A.

P. S. You are very kind in furnishing me with the valuable food for thought your letter affords. I find no "pins" therein to "*knock down*," but, instead, I find some pins to be interwoven in the lining of my hat!! A.

DEAR DR. A.

I am glad you think my *perhapses* contain food for thought. I am constantly looking for facts upon which to form a theory. Allow me one word about this term theory.

In its application to dental caries, I understand it to mean the arrangement in the mind of discovered facts, so that the relation which each fact bears to the other facts shall be obvious. At present, we have the component parts of enamel and dentine, the form of structure, the arrangement and juxtaposition of teeth favorable and unfavorable to the retention in contact with them of injurious matter. We have acids, alkalies, organisms in all stages of development and conditions favorable to mechanical abrasion. We also know that caries exists, and something of its morbid anatomy. While these facts exist in the mind in a chaotic state, we have no theory; but when we have shown the relation in which these facts stand to each other, which are causes and which effects, which primary and which secondary, and which only sequences, a theory has been presented. I think a theory may be defined thus: The arrangement of facts in the mind, so as to show the relation of parts to the whole phenomena of dental caries.

For a statement of the chemical theory, I refer you to Dr. Watt's paper.

A word in relation to the germ theory.

First, it does not imply that acids, alkalies, abrasion, defective formation of enamel and dentine, inherited tendencies, conditions of health and degrees of vitality, some or all of these do not furnish favorable conditions for germs to begin and prosecute their work. But it does mean that these conditions being present, caries is largely due to the action of Bacteria and other fungi. These are the septic agents without which the other conditions and agents would be comparatively harmless in producing dental caries. Their mode of operation may not be yet understood. That they may bring about caries by interference with nerve function, by the absorption of nutritive material, or by appropriating some elementary constituent of formed tissue, perhaps oxygen, seems not improbable. To me the point of greatest interest just now is, how do fungi first penetrate the enamel? By an open door? Yes, often. Do they ever open the way for themselves through perfect enamel? Possibly. I have said enough —Good night.

Yours truly, B.

DEAR DR. B.

I have been thinking over this last excellent letter of yours, and as I have time I will devote some to a reply.

Of course, you do not think that I do not understand the definition

of theory, nor the application of one to dental caries. I think I do understand it, and my objection to formulating one upon the subject has been, and is based upon this, that our facts are not sufficient, *as yet.* We are rapidly gaining these, but we are gaining also with them some *pseudo-facts.* I accept your position *fully,* and I accept because it is a true exposition of my position, only I could not qualify it so well as you certainly have done. Now, we can begin to talk. Don't you see that the atony theory more fully meets all requirements? that it *more* fully accounts for the different types of decay, from the white to the black, than the germ theory does? Germs can *maintain* this disease so long as life forces are *weak*—no longer. Then, again, the *primary* cause of caries is still unknown, and in the case of perfect enamel and dentine, where decay exists, the *cause* of the disease is unaccountable on *any* theory we have, except the chemical. If, as Prof. Mayr says, the oxalate of ammonia test will show lime in sputum ejected after bringing acetic or citric acids in contact with teeth in the mouth, there is a proof at once of chemical action, the *least* softening affords a field for propagation of Bacteria. Then the work of appropriating nutritive matter at once begins, etc.; *but* we always have to presuppose a softening from the first period to the last, in *advance* of organisms. Now it is this pioneer corps that we are after, and until we come up with it, and properly interpret it, we cannot form an *intelligent* theory. So far as we have advanced, however, the atony theory is in advance of the germ theory to *my mind.*

Yours truly, A.

DEAR DR. A.

In dental caries I am disposed to limit the word *cause* to those forces which are essential in constituting and giving character to the disease, and to call other forces and conditions which of themselves do not make caries, by some other name. For instance, acids may cause *abrasions,* by dissolving away the lime and leaving the animal matter to be easily worn away. So weak an acid as that must be, which comes in contact with enamel, can hardly even irritate the vital structure, and acid in the "*nascent state*" is so infinitesimal that its effect and presence even can only be conjectured. Acids acting upon enamel can only cause abrasion. It seems that another agency is necessary to set up that self-sustaining process which is found in caries.

Now can atony do this? Atony is only a negative property or condition of vital tissues and organs. Atonic condition of the living structure may furnish less resistance to other forces, perhaps, but can

it be said to produce caries? Is it not itself a condition resulting from caries?

What do you say to statements like the following?

Acids may cause abrasion of enamel and dentine, but cannot of themselves produce caries.

Organisms may produce caries when conditions permit their access to the animal structure of enamel and dentine.

Abrasion and imperfect organization of enamel furnish favorable conditions, and uncleanliness furnishes the lodgment for Bacteria.

Organisms may appropriate protoplasm and the elements of tissue, and change nerve action so as to diminish vital resistance (causing atony), thus making conditions still more favorable to the progress of caries. The condition called "zone of resistance" may be produced by Bacteria, they withdrawing protoplasm, leaving the lime-salts in an abnormal combination with the diminished quantity of soft tissue.

The above is modestly submitted to your "hat-lining."

Yours sincerely, B.

DEAR DR. B.

You must be very careful or you will soon be beyond my powers of speculation, for it must be admitted that we are in this discussion upon ground highly speculative.

Your disposition to limit the word "*cause*" to those forces which are essential in constituting and giving character to the disease, etc., is of itself misleading, if we are to further our efforts in the direction of *How* and *Why* do we have a primary lesion in the enamel. For it must be continually borne in mind that we are seeking *causes* and not *sustainers* of the phenomena, dental caries; that only by a correct knowledge of those conditions about teeth that *produce* the enamel lesions, can we hope to intelligently treat them for prevention of the primary or secondary types of the disease.

The living matter in the enamel may be irritated by external agents, and yet no disintegration result from it. Let me illustrate by a case in practice: A young lady of 19, of an active, nervous temperament, has for two years suffered *periodically* from extreme sensitiveness (to *the touch* of any metal substance) of her superior incisor teeth. These teeth have small proximal fillings of gold, placed five years ago. They have needed no attention since, being as perfect to-day as when inserted. The teeth are large and well-formed, have ample room and are regular; but they are not of true color, being slightly opaque. The alveolar and gum tissues are apparently in perfect health. The

enamel is perfectly smooth, and not a spot of imperfect formation is visible. Dilute chloride zinc will give temporary relief; precipitated chalk freely used just before retiring gives relief. Abate such and other treatment, and the trouble returns; therefore, we see, in rare cases, that the living substance, even in the enamel, may be irritated; that a coagulating and antacid treatment affords relief.

I have no reason to look otherwise than favorably upon the theory of micro organisms *sustaining* a process of decay by appropriating oxygen and other nutritive elements from the organic matter in dentine, but it is a mere theory after all.

You speak what is to my mind a *great truth* when you say, "Abrasions and imperfect organization of enamel furnish favorable conditions, and uncleanliness furnishes the lodgment for Bacteria." We can hardly say that organisms may cause atony by the appropriation of nutritive material or its elements. Atony is the *constitutional* condition, and of course is a negative one. You have what is to my mind—humble though it be—a *correct* idea of Magitot's *zone of resistance*. It is lime-salts in "abnormal combination"—whether produced by Bacteria or not, I would not say. My "hat lining" is being filled with a bristling array of excellent pins given by my good friend.

Yours truly and sincerely, A.

DEAR DR. A.

You say, "Atony is the *constitutional* condition." It may be a constitutional condition, and it may be also a condition of an *organ* or a *tissue*. I said, "Organisms may cause atony" (meaning atonic conditions of dentinal fibrils) "by the withdrawal of nutritive material." If in addition to this there exists constitutional debility in consequence of which protoplasm in normal quality or quantity is not supplied to the fibrils, so much greater their debility, and so much less the resistance they are able to offer to caries-producing agents.

You say, "We are on ground highly speculative." If by speculative you mean visionary, not supported by facts and their reasonable interpretations, we will go no farther in this direction. But if you mean the better sense, the scientific and philosophic study of phenomena which have so long remained in doubt, we shall do well to go on. In our familiar way we can exchange ideas and examine facts and authority, both as a matter of pastime and of profit.

I presume you will bear with me while I refer to your question, "How and why do we have a primary lesion in the enamel?" Be-

lievers in the germ theory do not question that acid causes erosion of enamel, but they claim that erosion and caries are entirely different lesions. Erosion and abrasion may exist without caries. You think them a *cause* of caries. I regard them as a *condition favorable* to caries, the same as are structural imperfections of enamel.

Whether organisms carry their acid bottle with them to the border line of decay with which to dissolve the lime-salts, that they may gain easier access to the fibrils (see papers by Underwood, Sewell, Miller, etc.), or whether they destroy the living matter and as a sequence the lime-salts fall to pieces and remain as debris (Mayr) the savans must decide. In either case *caries* seems to be a disease of the living structure, while erosion by acid is the chemical decomposition of the lime-salts, confined principally to the enamel. If it penetrates to the dentine, the "eroded cavity is hardly ever undercut." How different this from the phenomena of caries, with its deep undercuts, its organisms and its irregularly penetrating lines of decay.

Cordially yours, B.

NOTE.—I have seen slides which seem to show that something (what more probable than *organisms*) causes devitalization of fibrils a little in advance of the fungi.

EDITORIAL.

ABSTRACT OF EDITORIAL IN NEW YORK MEDICAL RECORD, January 13, 1883.

"The New Pharmacopœia," after alluding to the importance of the work and its large circulation, the article refers to some of the conclusions which have been arrived at:

"For the first time, says Dr. L. Genois, in the College and Clinical Record, there has been given a concise but explicit description of vegetable and animal drugs. The new work abandons the old division into primary and secondary drugs and preparations. Instead of this, the list is arranged in alphabetical order.

"A large number of articles are dismissed, the total being about two hundred and thirty.

"With hardly an exception, the drugs or preparations omitted, we are well rid of. For the rest, there is nothing that will seriously embarrass druggist or physician. Perhaps the latter will most miss the

liquor morphiæ sulphatis and santonin—for which latter the santonate of sodium is substituted. The number of new articles introduced is about two hundred and fifty.

"A new class of preparations have been introduced which are called 'abstracts,' a name which we regard as a most unfortunate one. The term 'abstract' having become a part of medical periodical literature, and it at once suggests scissors and second-hand articles. To associate it with a powdered drug will require the beating out of new cerebral paths in medical minds.

"A prominent feature in the Pharmacopœia consists in the adoption of parts by weight in the process of pharmaceutical preparations.

"This change is of more interest to druggists than physicians, however, except as it perhaps foreshadows an adoption later of the metric system.

"Valuable tables of the solubility of chemicals in water and alcohol, of saturation of alkalies by acids, and of acids by alkalies, are given. Some alterations have been made in the relative proportions of active constituents to the finished preparations.

"The alterations chiefly affect the tinctures. These changes will not affect the dosage very much, the actual change even in the opium preparations being less than has been rather sensationally announced.

"There has been a change made in the terminal nomenclature of the organic alkaloids, the suffix 'ina' being uniformly used instead of 'ia,' as in 'quinina' for 'quinia.' This will make little practical difference in prescription writing.

"The diluted mineral acids are all to be prepared with a strength of ten per cent. This makes hydrochloric acid one-fourth stronger, and sulphuric acid one-sixth weaker. The tincture of aconite root is reduced one-seventh, and its name has been changed to simple tincture of aconite. The extract of aconite is now to be made from the root instead of the leaves, and is said by Dr. Wood to be nearly one-half stronger than the old extract of the leaves."

In conclusion, the article says: "It may be positively stated that, on the whole, it is the best work of the kind in any language."

A PLEASANT REMINISCENCE OF DR. WEBB.

The Coatesville Times, in referring to the death of Dr. Marshall H. Webb, in this city, gives this pleasant reminiscence of him when a young man:

"When a boy, living with his father, in East Fallowfield township,

Chester county, some figures which he had carved from wood and set to playing antics by water power in a stream near his father's house attracted the attention of Dr. Frank Hickman and Professor Jonathan K. Taylor, of Coatesville, who were riding by. They hunted the boy up and found him frank, modest and attractive. Dr. Hickman, who was a dentist, was struck with the boy's mechanical skill, offered to take him to his home and teach him the art of dentistry, if Professor Taylor, who then was Principal of Chester Valley Academy, in this borough, would assist him in his scholastic studies. This was agreed to, and Marshall, or 'Marsh,' as he was known in those days, became a resident of this town in 1861. He progressed admirably with both studies, and upon his graduation settled in Lancaster. His practice grew rapidly, and he was soon regarded as the best dentist in that city."

A few of our old subscribers have not yet sent in their "enclosure" for renewals. It is just two dollars, gentlemen.

It seems to us that Dr. Watt likes to "discuss" (?) the etiology of dental caries with Prof. Mayr, after all. His "adieu" meant, simply, *au revoir*.

The article by C. S. Tomes, F. R. C. S., that we give in this number, is a long one, but worthy of a careful reading by all who are interested in the investigations of the day.

OPERATING TABLE AND LABORATORY.

A REPORTED CASE OF MERCURIAL POISONING BY RED RUBBER.

The story of a patient being poisoned with mercury from a red rubber denture has been going the rounds (in this vicinity, at least,) of late. In a few words, this is the case: A lady in Westfield, Mass., has been quite out of health for some five or six years, during which time several physicians were employed, but without improvement. During the last year, however, a physician was found who apparently succeeded in helping her. On being interviewed, he says: "I did not know that she had worn red rubber plates, and never thought anything about the possibility or probability of the mercurial influence coming from that source until after the diagnosis was made; however, her symptoms clearly pointed to poison from *vaporized* mercury, which differs from other forms of mercurial poisoning. The talk about 600°, more

or less, of heat being requisite before mercury can be set free in the mouth is all wrong, that being simply the *boiling* point. Mercury will vaporize at 62°, which is lower by 30° than exists in the mouth. I am decidedly of the opinion that the patient is suffering from the poisonous effects of the *red* rubber plates."

This is all our correspondent writes, though we hope to learn more of the case soon, when we shall have some comments to offer.

PRACTICAL ITEMS WANTED.

As a profession, we are all taught the idea that a dental journal is primarily for the purpose of making known to each other our experience, methods of practice, etc. As a fact, the contributors to our journals are but very few in number—not one where there should be a hundred. The result is, that many who take a journal very likely look it over and throw it down in disgust, because there is not more of practical value in its contents. We wish, gentlemen, you would just stop right here, and meditate for a few moments and see if you cannot readily find the explanation. Is it not that you, personally, as well as scores of others, are not "doing as you would be done by?" You are perfectly willing to receive, but never to give. We will endeavor to be charitable on the ground that you may be one of the extremely modest sort, not inclined to consider that your gifts are equal to others. We assure you, however, that you are just the one we want, and that when we hear from you the communication will be something more than "directions how to prevent dark joints in a rubber denture"—not that that is not a desirable thing in itself, but it is so old a subject that every dentist (and student) ought to be ashamed if without the knowledge, and also the ability, to overcome the obstacles to that end.

In reading the different publications from month to month, do you not realize that there are many little hints and suggestions you might make which you have never seen in print, and which you consider of much value? It is just these items we want, and when we say we, we mean the profession. Write down a few of these items and send them in and, our word for it, not only others but yourself also will find the journal much more interesting. Out of the hundreds who read these lines, and are eminently qualified, how many will spend a few moments in this manner? Let us hear from you, gentlemen, and let the communication be anything from a formal paper to two-line items, though the last are perhaps preferable.

MICROSCOPICAL.

On December 26, 1882, I received the following letter, and package mentioned in the letter:

102 TOURO STREET,
Newport, R. I., December 25, 1882.

DEAR DR. ROSS—I send you herewith a right upper first molar that I have just extracted from a healthy looking plumber, perhaps twenty-five years of age, and evidently a user of tobacco. He says he has had no trouble with the tooth until within the past twenty-four hours. During the night it had ached quite severely, but no especial tenderness to pressure had been developed. Immediately after I extracted it, I immersed it in diluted alcohol, in which it has remained several hours. The paper in which it is now wrapped was dampened with water and glycerine. The abnormal growth between the roots is to me quite a curiosity, though I have at long intervals seen several similar instances of it. It occurred to me that you might like to make some study of the histological character of the tissue.

Very truly yours,

C. A. BRACKETT.

Extending from a line below the base of a distal cavity in the crown to between the roots was a growth that did not show firm attachment except at the point where the growth evidently first developed at the cervical edge of a cavity below the margin of gum. At this point the attachment was firm, and at the edges of the growth it was attached to the pericementum upon the roots. The growth was quite extensive. I placed the tooth immediately in a 1 per cent. solution of chromic acid. After the surface had undergone sufficient alteration to admit of a few sections being cut, several were obtained with the section of growth attached. These plainly show the fibrous character of the growth, the endothelia of blood-vessels showing vascularity. The fibrous tissue was, at the point of attachment, continuous with the pericementum. The clinical and pathological features of the case grouped with the histological features show that the tumor was an epulo-fibro-erectile growth, probably benign, and not the cause of the pain that resulted in removal of the tooth. Deeper sections from the tooth will doubtless reveal pulpitis. It was an epulide; it was fibrous; it was an erectile tumor, because this class of tumors yield readily to pressure, but refill after pressure is removed. It was benign, because such tumors are seldom or never painful, while malignant growths are, in a like situation, painful from the beginning; and of the epulides we are taught that there are but two varieties that can

with any certainty be considered benign—the ordinary pulp fungoid that may always be considered benign, and some of the fibroids. Dr. Brackett has suggested that this case is one the like of which is not often met with by the dentist, and that its clinical and histological features are worthy of record. I therefore comply with his suggestion in reporting the case. I am indebted to the works of Professors Garretson and Heitzmann for enlightenment upon the obscure points.

A. M. Ross.

Chicopee, Mass., February 13, 1883.

CARBOLIC ACID.

Capping Nerves and Filling Teeth in Sections.

A great distinction must always exist between facts and theories, though it is evident that theories grow out of supposed facts. A thing stated that is not a fact will lead the credulous into error; and errors once adopted are hard to break away from. It is only by the most persistent effort that we can unlearn those things that we once considered vital to our interests. There seems to be an effort on the part of many individuals to belittle, and to lead others to abandon the use of, carbolic acid in the treatment of diseased and inflamed pulps. It is about the same cry that was raised thirty years ago against the use of mercury, and yet mercury is more extensively used in its various forms and combinations than ever before. To be sure, the blue pill and calomel are in a great measure abandoned, but mercury in some form is the "sheet anchor" (as was said in the olden time) with the regular practitioner, and enters into almost every form of pathy in the land. Until we can have something better, until we can find as painless and as salutary an agent to relieve suffering and help to save the teeth and restore them to good sound health, let us not call carbolic acid hard names. The great problems in dentistry are not to be settled by denunciation any more than is the Christian religion. It is better to "hold fast that which is good." It is possible that a revision of practice may be needed with some, but the happy effects of a thirty years' experience with this drug cannot be pushed aside by any denunciation whatever.

Having protested so strongly against this wholesale "slaughter of the innocent," we would like to say a word about its uses. First, carbolic acid paralyzes the fibrils of teeth so they can be amputated without pain, and still continued alive. Within the past two weeks

a little boy and a little girl had each the misfortune to have an incisor broken off by an accident in sliding down hill. Pain was relieved almost instantly by an application of carbolic acid. These teeth can now be saved by capping, if it is thought better than to have them extracted.

The failures often experienced in capping exposed pulps are due to the caps being misplaced after the oxychloride has been applied. When the powder is mixed with carbolic acid as the first dressing to prevent the harsh effects of the zinc in coming in contact with the pulp, and it is covered with *Guillois's* cement (we think that the strongest and best preparation), so that it adheres closely to the walls of the tooth, it must not be displaced. It does more than simply to cover and protect the pulp; it takes up that portion of the powder that is mixed with the acid, and lifts it away from contact with the pulp and relieves the pressure, and allows circulation to rally from paralyzation. This can readily be seen by experiment upon a piece of glass, and examination of the opposite side of the glass after the cement has hardened. Now, if an approximal cavity is to be filled, the cement should be removed from the cervical wall, about half way to the entrance, leaving sufficient room to start your filling, and the filling should lap on the cement to keep it firmly in place, when the lower portion can be cut away without danger of moving the cap from its original position, after which fill to the outcome and finish. There can be no danger of inflammation if carefully done, for the powder is lifted from the pulp, and circulation freely takes place, and the pulp is kept alive.

Our differences are often more in theories than in facts; but we must always keep in mind that discussions that are carried on in a kindly manner stimulate thought, and through thought the profession will grow. It is probable that gold will always be used as a filling material, but it does not follow that there may not be combinations of other metals with gold that will make a more perfect filling than gold itself. So, also, there may be substitutes for gold, but it still continues par excellence in the mind of the great body of dentists. Gold has stood the test of time for artificial dentures, but it cannot be made practical for the millions who wear artificial teeth, on account of the expense. Conservative practice is the best, for the ultimatum of that is to preserve the natural teeth. Iconoclasm is poor practice in dentistry. There were probably more pounds of mercury used as medicine forty years ago than now, but of the twenty different preparations and combinations—some stimulating, some escharotic, some drastic and

others sedative or secretory, some used in the most violent forms of diphtheria, and then again in almost all chronic difficulties—it is probable that mercury will do what no other medicine will do; and so with this much-abused carbolic acid as a helper in treating diseased teeth. I have never used eucalyptol, but I write in defense of carbolic acid as I would of an old friend when not present.

J. A. ROBINSON, Jackson, Mich.

A STEAM TRICYCLE.

We understand that a gentleman of Buffalo, N. Y., has invented a steam tricycle, which is reported to work to a charm—one gallon of gasolene (which is used for fuel) being sufficient to drive it fifty miles, the rate of speed attainable being anything under twenty-five miles per hour. We think the dental profession well qualified to operate such a vehicle, and so give the above item.

SOCIETIES.

THE BROOKLYN DENTAL SOCIETY.

The February meeting of the Brooklyn Dental Society, held on the evening of the 12th inst., at the residence of Dr. Thomas Fry, No. 18 Clinton street, was one of the pleasantest gatherings since last Summer's vacation, as well as of great interest to every one present. "The Etiology of Dental Caries" came up for the third time, and was discussed by Dr. Frank Abbott of the New York Dental College, and Dr. F. Y. Clark of 35 West 35th street, New York, one of the few members of our profession abundantly able to translate for us the unspoken language of the microscope.

Dr. Abbott, after a brief introduction of the subject, quoted at some length from the article of Prof. Mayr, in the last number of the *N. E. Dental Journal*, and from the article of Dr. Miller of Berlin, which appeared in the *Cosmos*. If Prof. Mayr is correct, said the Dr., then the acid theory must sink away down below par. Dr. Miller contends that the various microscopic organisms cannot invade the dentinal tubules unless the lime-salts have been first dissolved away by acids, and Prof. Mayr claims that the lime-salts are never disposed of in that way. Here seemed to be a dilemma, but Dr. Abbott

thought he could furnish a third leg to that stool so it might present a more reliable appearance. The living substance in the tooth structure was, he thought, like in its various properties to living tissue wherever found. The acids in the mouth must act as an irritant to this organic matter, causing finally a state of inflammation. Inflammation here, as in all living tissue, causes a swelling of the parts affected, enlarging the canaliculi, and thereby crowding out or disintegrating the lime-salts. The Dr. proclaimed himself an advocate of the acid theory only so far as to admit that it was probably the first cause of the irritation which finally brought about the state of inflammation.

In closing, he propounded numerous conundrums which prevented his accepting as correct what is known as the "germ theory." If this theory be correct, he said, why do we find so often strong and beautiful teeth in mouths swarming with bacteria, and where a brush was never known to enter? Why is the decay in a tooth sometimes so extremely sensitive, if the living substance has been eaten out or absorbed by the organisms found there? Again, these organisms gather in greatest numbers in and around deposits of tartar. Why, then, are the lower incisors the last to be attacked by decay, that being where calculus is most abundant?

Dr. Clark replied to some of the statements of Dr. Abbott, advocating with earnestness the germ theory as giving the best explanation of the phenomena of caries, and urged upon the profession a more practical knowledge of the use of the microscope. He thought the time was near at hand when all intelligent dentists would consider necessary, first of all, a careful examination of the fluids of the mouth with the aid of a microscope. He claimed to be able to detect the slightest trace of nitric acid by that means, but said he had never found it present in any mouth. Dr. Clark urges the frequent use of antiseptic washes, and said he had found nothing he considered as effective in the destruction of germ life as carbolic acid. This he used in the form of a solution in glycerine, one part of the crystal being dissolved in three parts of the latter, to which is added eighty parts water.

It was rather late when the meeting closed, but I am sure every one present went home feeling that he had been amply repaid for the time consumed.

The thanks of the Society were tendered unanimously to both Dr. Abbott and Dr. Clark.

The Society will meet again on the evening of the 12th of next month, at the residence of Dr. Van Wart, Noble street, Greenpoint, at which meeting all our friends of the "Journal" will be welcome.

Truly yours, W. H. J.

The seventh annual meeting of the Vermont State Dental Society will be held in the parlors of the Bates House, Rutland, Vt., March 21, 22 and 23, commencing at 7.30 P. M., on Wednesday, the 21st. Return checks free over the railroads. Rates at the hotel, $2.00 per day.

Dr. C. C. Boynton, of Brandon, will give an essay, Wednesday evening, on Bacteria, aided by microscopical illustrations. Other essays are, Evil Effects from Loss of Teeth, by Dr. James Lewis; Dental Education, Dr. S. J. Andress; and Why our Fillings Fail, Dr. W. S. Curtis. Subjects for discussion are, Cases in Office Practice; Regulating Teeth; and Preparing and Filling of Pulp Canals.

The president's address comes, according to programme, on Thursday afternoon, and a banquet, Thursday evening, "to which the ladies are especially invited."

This Society has an active membership of forty-three, of which Dr. S. D. Hodge, Burlington, is president; Dr. E. E. McGovern, Vergennes, secretary, and Dr. R. M. Chase, of Bethel, chairman of the executive committee.

The profession in Vermont, and other States as well, are cordially invited to attend this meeting.

BOARD OF DENTAL EXAMINERS, OF ALA.

The State Board of Dental Examiners of Alabama will hold their third annual meeting in Montgomery, Ala., commencing the second Tuesday (the 10th day) in April, 1883, at the same time and place with the Alabama Dental Association. All parties desiring to practice dentistry in Alabama must make application for license on the first day of session.

T. M. ALLEN, D. D. S.
Sec'y B. of D. E. of Ala.

Eufaula, Ala.

SELECTIONS.

HYDROGEN PEROXIDE AS AN ANTISEPTIC.

According to the *Comptes Rendus*, Mm. Paul Bert and P. Regnard have studied the action of hydrogen peroxide upon various forms of organic matter and upon fermentation, and find that it possesses very remarkable antiseptic properties. All fermentation due to an organized ferment is immediately and definitely arrested by hydrogen peroxide, the ferment is killed, and even after the removal of the hydrogen peroxide by one of the substances which destroys most rapidly, the fermentation does not re-commence. The yeast of beer is in this manner killed instantly, although it possesses itself the property of decomposing hydrogen peroxide. Specimens of wine, urine and milk, each containing a few drops of hydrogen peroxide, have been exposed for séveral months in open vessels without exhibiting the least sign of alteration; while other specimens of the same identical liquids, without the addition of hydrogen peroxide, placed beside them, were in a state of complete decomposition. Although organized ferments are destroyed by hydrogen peroxide, the soluble ferments do not seem to be afflicted by it; saliva, diastoes, the gastric and pancreatic fluids continue to act in solutions containing hydrogen peroxide. Mm. Bert and Regnard have also studied the action of hydrogen peroxide upon various organic materials, including the albuminoid substances and all the tissues composing the animal body in a healthy or pathological state. The results of their investigations may be summed up as follows: (1) Hydrogen peroxide, even when very dilute, arrests fermentations due to the development of living organisms, and the putrefaction of all substances which do not decompose it. (2) It has no effect upon diatose fermentations. (3) Dilute hydrogen peroxide is not destroyed by fats, starches, soluble ferments, egg albumen, casein, the peptones, creatine, cretinine, or urea. (4) It is rapidly destroyed by nitrogenous collagens, by muscatin, fibrin of the blood, and various nitrogenous vegetable matters. (5) This action is definitely arrested by a temperature above 70 degrees. Putrefaction, however, leaves it entirely intact.—*The Sanitary News, Chicago, Ill.*

Dr. Schmidt, of New Orleans, says the Bacillus tubercle is a fat crystal. See *Cincinnati Lancet and Clinic*, of January 13th, if you are interested.

Quotations from the Valedictory Address of S. W. Dennis, Dean of Dental Department of University of California.

The late Professor Austin said: "But few minds can even approach that universality of genius which characterized Hippocrates and Hunter, hence devotion to a specialty of the medical art detracts nothing from the position which a man's talents entitle him to assume."

He further says, "where are we to look for the most valuable contributions to medical science and literature except to those who apply themselves exclusively to some one class of diseases."

. . . . . .

You came like so much bullion alloyed with some base metal. You have passed through a process of refining, and have received the die of approval, and to-night you are to be received into the profession with all the rights and privileges pertaining to the degree for which you have labored diligently and faithfully.

As it were, you are on this occasion united to the profession you have chosen.

Although you have been refined, and have received the stamp of approval, you will, notwithstanding, have your purity questioned.

Like coin from the mint, you may go to the extremes of the earth, and you may be knocked about or dashed upon the counter to test your purity.

If you are conscious of that purity, and you maintain it, you will always be taken in the end, for your full value, while the counterfeit, when detected, will be cast into the company where it belongs.

Your luster will be dimmed through circumstances over which you have no control, because by the public you are associated with men from whom you receive the deadening and contaminating stain.

But if you maintain the characteristic ring you will be known and recognized by it.

You will find it difficult to compete with practitioners without knowledge.

You will wonder how the counterfeit can so long pass from one person to another without detection, but you must maintain your character, else the detective will begin to make inquiries as to your source, and then your Alma Mater may be scrutinized and possibly condemned.

Youth longs and manhood strives, but age remembers.—HOLMES.